

FLOWLINE

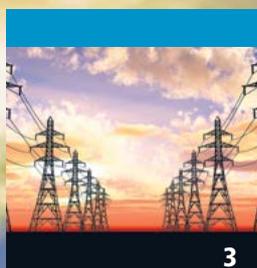
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appea the voice of australia's oil and gas industry



Tough times demand smart thinking



Paul Fennelly
Acting Chief
Executive

The low oil price is a powerful reminder to all petroleum companies of the need to keep a tight grip on costs and operating expenditure.

Falls in the prices of oil, LNG spot cargoes, iron ore and coal should also alert Australia's state and federal governments that revenue and prosperity cannot be taken for granted.

If this nation's remarkable run of unbroken prosperity is to be preserved, both industry and government must address serious competitiveness issues.

Oil and gas companies are already cutting back on exploration and development.

This will eventually lead to a supply shortfall, which will in turn trigger a price rise that will spur further exploration and development.

How can Australia position itself to take advantage of the opportunities that lie ahead?

Companies are already focusing on reducing their costs, seeking opportunities for collaboration and investing in technologies that can enhance efficiencies and minimise costs.

But government must also play its part.

Now is the time to redouble efforts to remove red tape and to make regulation a competitive advantage rather than a burden.

Unnecessary policy and regulatory hurdles are increasing running costs for existing oil and gas operations; pushing up building costs at other projects now under construction; and deterring the exploration and investment needed to develop new projects.

Without exploration, Australia's ability to capitalise on future development opportunities is limited.

Government must urgently increase the efficiency of approvals processes to sustain investment in exploration.

It must also remove unnecessary restrictions on exploration, particularly in NSW and Victoria where activism and unfounded fear campaigns have overridden science, operational realities and good policy.

Our industry and nation also face other pressing issues.

Australia has acquired an unattractive reputation for high project costs and for industrial strife.

We need flexible labour market arrangements and local content structures, not only to attract further investment in major gas projects, but also to secure high-value jobs in the long-lasting operations and maintenance phase of LNG projects.

Australia needs a regulatory system that fosters innovation, flexibility, consistency and certainty.

The policy and regulatory environment must recognise and respond to the global environment in which our industry operates.

Great opportunities lie before us.

Australia has very large undeveloped gas resources, a good skills base and is now developing extensive LNG infrastructure. These assets can be leveraged not only for future LNG developments, but also for an expansion of domestic gas production and consumption.

We export about 1.1 trillion cubic feet of gas a year, and the domestic economy also currently uses about 1.1 TCF annually.

Yet Geoscience Australia estimates that Australia has more than 800 TCF of known gas resources.

We have enough undeveloped gas not only to meet both existing domestic and export demands, but also to actually increase both our domestic gas consumption and our gas exports.

Doing so would enhance energy security and economic development, not only for Australia but also for our major Asian trading partners. It would also help reduce the growth of greenhouse emissions both domestically and globally.

Economics and history show that Australia has a competitive advantage in resource development.

Science and history show that gas resources can be developed safely and sustainably.

Let's roll up our sleeves and lay the foundations for another two decades of Australian prosperity.



Australia's year of LNG milestones

After years of hard work and unprecedented investment, 2015 will be a year of milestones for Australia's LNG industry.

Less than a week into the new year, the maiden cargo departed from Queensland Curtis LNG—the first of four projects expected to be commissioned in Australia this year.

QCLNG (operated by BG Group) is also the world's first project to ship LNG sourced from coal seam gas—a significant technical and engineering achievement. This project is expected to bring a second production train online in the third quarter.

QCLNG is located on Curtis Island, off the coast of Gladstone, as are two other projects—Gladstone LNG and Australia Pacific LNG.

GLNG (operator Santos) and APLNG (operator Origin Energy) are expected to ship first cargoes in the third quarter of this year and to bring their second trains into production before the end of 2015.

On the other side of the continent, the first train at Gorgon LNG (operator Chevron Australia) is expected to start production in the final quarter.

Last year, there were three projects—North West Shelf, Darwin LNG and Pluto—exporting gas from Australia.

By the end of 2015, Australia will have seven operating LNG projects.

The scale of this achievement becomes clear when measured in a global context.

When QCLNG entered production, Australia overtook Malaysia to become the world's second largest producer.

By the end of 2015, Australia will have more than doubled its 2014 LNG capacity—jumping from 24.7 million tonnes of LNG a year to 55.1 million tonnes a year.

This will be more than twice as much as Malaysia's capacity of 26 million tonnes of LNG a year.

Just the beginning

While 2015 is a year of milestones, it is just the first act in Australia's LNG revolution.

In 2016, Gorgon's second and third trains will start up, as will the first train at Wheatstone LNG (operator Chevron Australia). This will push national LNG capacity to 70 million tonnes a year.

In 2017, Ichthys, Wheatstone Train 2 and Prelude LNG—the world's first floating LNG project—will start production.

That year, Australia will overtake Qatar to become the world's largest LNG producer.

Our national capacity will reach 86.5 million tonnes a year, compared to Qatar's 77 million tonnes a year.

In for the long haul

While Australia's LNG construction phase is already beginning to wind down, the country's LNG industry

is entering a new and much longer phase.

The current low oil price is affecting LNG spot prices, but the bulk of LNG production is underpinned by decades-long supply contracts

LNG projects have long life spans. Successful oil and gas companies operate in timeframes of a decade or more, taking into account a wide range of possible crude price, economic and policy developments.

Short-term fluctuations don't affect major planning decisions.

The companies building Australia's current crop of LNG plants talk about 30-year time frames, but this is a sensibly conservative estimate.

Australia's oldest LNG project—the North West Shelf Venture—shipped its first cargo in August 1989, almost 26 years ago.

Since then, it has grown from one production train to five. The project partners are now undertaking exploration work intended to find more gas and extend the project's operating life by another 20 years.

So we can expect the North West Shelf to have an operating life of at least 45 years.

Some of the LNG projects now being built or entering production could have similar lifespans and all of them can be expected to operate for at least 30 years.

They will provide decades of tax revenue and income for suppliers as well as thousands of highly skilled jobs.



Flexible + reliable + cleaner = effective

DAMIAN DWYER

Increasing the use of Australia's extensive gas resources would not only enhance energy security but also help the nation meet greenhouse emissions reduction targets at least cost.

Natural gas is an essential part of Australia's energy mix because its combination of cleanliness, reliability and flexibility cannot be matched by other types of fuel.

Unlike wind and solar power, gas-fired power is reliable and can be run continuously.

Unlike coal-fired power, gas-fired power can be quickly started and stopped to meet spikes in demand or to fill gaps in other forms of power production.

These properties mean gas can be used for baseload power or peaking power, and can also fill the gaps in intermittent power generation.

Gas crucial to any rational energy strategy

This combination of features means that, in order to be effective, any energy security or emissions reduction strategy must include the use of natural gas.

Modelling done by South Australia's Electricity Supply Planning Council shows that, for example, every 5,000 megawatt of wind power generation requires around 2,100MW of gas-fired power generation to ensure reliable electricity supply.

This has implications for both energy security and emissions reduction.

High levels of energy security can only be achieved if an abundant, reliable, flexible and quickstarting energy source is available to fill in at times of peak demand or unforeseen outages.

Renewable energy can only reduce emissions if natural gas is used to fill in the gaps when the sun isn't shining or the wind isn't blowing. Otherwise, coal-fired plants must be kept idling.

Gas can be used for baseload power or peaking power, and can also fill the gaps in intermittent power generation.

- Baseload power is the level of generation needed to meet forecast minimum demands. Baseload power plants must run constantly and at predictable levels.
- Peaking power is power that can be brought online quickly in periods of peak demand.
- Intermittent power is any source of energy (such as solar and wind) that is not continuously available.



Australian LNG exports deliver global emissions reduction benefits.

Reducing emissions

Currently available natural gas technologies produce only 30 to 50 per cent of the emissions produced by current coal technologies in generating electricity.

The CSIRO and the Australian Council of Learned Academies have found that current generation coal-fired power stations produce between 0.8 and 1.2 tonnes of carbon dioxide equivalent greenhouse gas emissions (CO₂-e) per megawatt hour (MWh) of generation. By comparison, a combined cycle gas turbine power station produces only around 0.35 to 0.36 tonnes CO₂-e/MWh.

Gradually replacing ageing coal-fired power stations with gas-fired power would greatly reduce Australia's greenhouse gas emissions.

And when converted to liquefied natural gas (LNG) for export, natural gas can also help reduce greenhouse gas emissions in Asia.

For every tonne of greenhouse gas emissions generated by LNG production in Australia, up to 9½ tonnes of emissions are avoided in Asia when this gas is substituted for coal in electricity generation.

This means the global benefits of LNG offset by many times the emissions generated in its production.

Other environmental benefits

Natural gas also uses much less water than coal-fired power and produces much lower levels of noxious substances such as sulphur dioxide, nitrogen oxides and fine particle emissions.

Burning gas instead of coal improves urban air quality, which is particularly important in many Asian countries that are importing Australian LNG or considering increasing their LNG imports.

The way forward

Australia has more than enough gas for both domestic and export markets.

Increased development of Australia's extensive gas resources would greatly enhance energy security and emissions reduction, both in Australia and in our LNG export markets.

Show leadership and step on the gas

RICK WILKINSON

Developing Australia's extensive onshore gas resources can deliver enormous economic and environmental benefits, not only for Australia but also for our Asian trading partners.

But this will only happen if there are rational policies that allow market signals to operate and enable timely development of resources.

That means removing unnecessary barriers that not only hinder gas operations but also misguide communities on scientific issues and risks.

Unfortunately, Australia faces many such roadblocks.

Our national government, every state and the Northern Territory have undertaken reviews of unconventional gas, hydraulic fracturing or both.

Every scientific and government review in Australia has reached the same conclusion—the environmental risks associated with onshore gas operations, including hydraulic fracturing, can be managed effectively, providing a robust regulatory regime is in place.

For example, the *Report of the Inquiry into Hydraulic Fracturing in the Northern Territory* (or Hawke Report), was released in late February.

It found that: 'Consistent with other Australian and international reviews, the environmental risks associated with hydraulic fracturing can be managed effectively subject to the creation of a robust regulatory regime.'

Hydraulic fracturing can be used to develop the Territory's shale gas resource, estimated to be one of the largest in the world.

Hydraulic fracturing has already been performed on more than 30 wells in the Territory since the 1970s without incident. In the Cooper Basin (north-east South Australia and south-west Queensland), about 700 wells have been hydraulically fractured since 1969 without problems. Some of these wells have been fraced several times.

As the Hawke Report stated: 'The substantive weight of agreed expert opinion leads the Inquiry to find that there is no justification whatsoever for the imposition of a moratorium of hydraulic fracturing in the Northern Territory.'

The Hawke Report and reports from other states are robust documents. They have reached their conclusions using science, evidence from oil and gas operations, and risk mitigation assessments.

There is no question that onshore gas developments must be sustainable and must benefit not just the wider nation but also local communities.

This is already happening in Queensland where the gas industry is making the Surat Basin region (Toowoomba, Maranoa and the Western Downs) more prosperous and economically sustainable.

By bringing infrastructure and investment to several rural and regional districts, the industry is generating new jobs and strengthening and diversifying the Surat's economy. In once-shrinking towns, young people can now find well paid careers in the region where they were raised.

Queensland now has more than 5,000 land access payments between gas companies and farmers. Many local farmers now also have a reliable second income stream from compensation payments and part-time work with gas companies.

This should not be surprising.

Under a political and legal system very similar to Australia's, Canada has managed to develop substantial gas production. Coexisting with rural communities and a vibrant agricultural sector, its industry produces more than 6,300PJ/year from onshore gas fields. This is more than 15 times Australia's onshore gas production of 418PJ/year.

Similarly, Texas produces more agricultural value than any Australian state, yet it has more than 218,000 onshore wells.

Canada and Texas have been able to foster diverse rural economies that include both gas industries and agriculture.

But whatever the lessons of science and history, some groups will still oppose gas operations, just as some oppose vaccinations, water fluoridation and wind turbines, regardless of the evidence.

This opposition does not mean these developments should not proceed.

Gaining broad support from the community requires a mix of leadership and demonstrated industry performance.



Science and history show that onshore gas resources can be developed safely and sustainably.

Exploration and production activity is one of the keys to building confidence in the industry.

There is nothing like a well-run drilling operation, with a happy landholder, full restaurants and motels, and busy local contractors to overcome the untruths and misinformation spread by opponents.

What is clear is that another review or study on top of the volumes of existing studies is not going to trigger the hoped-for epiphany.

Leadership that brings along the community, and allows the industry to demonstrate its credentials is the path forward.

The size of the prize

Geoscience Australia estimates that proven and probable (2P) onshore gas reserves in the eastern Australian gas market (all states except Western Australia and the North Territory) exceed 45,000 PJ or about 43 trillion cubic feet. There are contingent (inferred but unproven) resources of a similar amount.

Even at the conservative current gas spot prices of around \$3.36 per gigajoule, the revenue from 2P reserves would be more than \$150 billion.

The economic prize for Australia is large, not just in developing the reserves, but also in badly needed regional development, employment, infrastructure, royalties and further indirect economic benefits.

Australia is perfectly placed to supply LNG to Asia. Many Asian countries are growing quickly and need reliable, flexible and cleaner energy for households and industries in their smoggy cities.

Next page— Land access agreements that deliver good outcomes for both parties

Western Australia and the Northern Territory have drawn on lessons from Queensland to develop land access agreement templates designed to deliver good outcomes for both parties.

Positive partnerships in the bush

STEDMAN ELLIS

Like other forms of energy production—including wind power, solar arrays and coal mines—onshore gas operations must be developed in ways that fit in with existing land uses and communities.

The sparsely populated desert of the Cooper Basin has historically been Australia's most important onshore gas region.

But as the industry expands, lessons can be drawn from agricultural regions such as the onshore Perth Basin where more than 320 wells have been drilled over the past 50 years.

Queensland's onshore gas industry also provides a mature framework based on more than 5,200 land access agreements signed since 2011.

After a rocky start, Queensland's gas and agricultural sectors have developed a coexistence framework that allows both industries to grow and holds lessons for other regions.

Australian governments and agencies at all levels are recognising the need to build community

engagement systems that facilitate land access while also delivering benefits for landholders.

A recent Productivity Commission report, *Examining barriers to more efficient gas markets*, (released in March) recommended developing codes of practice for community engagement as well as template agreements for conduct and compensation.

Similarly, the recent *Report of the Inquiry into Hydraulic Fracturing in the Northern Territory* (or Hawke Report) also stressed the need for positive land access templates that facilitate coexistence.

WA and NT look to best practice

For several years, APPEA has been working with agricultural peak bodies to deliver model agreements promoting positive coexistence with landholders that oil and gas companies can readily use.

The goal is to produce a good outcome for both parties.

In Western Australia, this work has been underway for two years.

This process is expected to deliver a voluntary model agreement and two information guides to assist companies and landholders with access negotiations.

The final agreement will reflect the rights and obligations of both parties under existing legislation and will draw on good land access practices from across Australia.

It will also provide clarity that companies will pay agreed reasonable costs to help the landholder obtain technical, financial and legal advice for negotiating a land access agreement.

A similar process has been underway with the Northern Territory Cattlemen's Association since 2013.

These model agreements will help ensure that negotiations are respectful, informed and timely.

This will ultimately promote long-term coexistence by delivering shared benefits for both farmers and petroleum companies.

Australia needs an LNG productivity boost

Hop to it: industry, governments and unions must cooperate to boost Australia's competitiveness in LNG.



MIRANDA TAYLOR

Over the past 25 years, Australia has distinguished itself as a reliable and secure supplier of liquefied natural gas. Within three years, our country will overtake Qatar to become the world's largest LNG exporter.

Global LNG demand is continuing to grow and Australia has abundant natural gas resources.

The country has a great opportunity to leverage its extensive—and still expanding—gas infrastructure to develop a new generation of brownfield LNG projects. Floating LNG projects—with liquefaction plants moored above offshore gasfields—also have great potential.

Gas fuelling the economy

A recent PwC report, *Value Adding: Australian Oil and Gas Industry*, shows LNG production will double over the next five years and the value of LNG exports is expected to reach around \$60–70 billion by 2019.

LNG is the largest and most valuable sector of the Australian oil and gas industry. The industry's production profile directly represented around 2.0 per cent of national GDP in 2012–13.

In 2030, when production (on the basis of current and forthcoming capacity) and prices are expected to stabilise, the oil and gas industry's total economic contribution is projected to be around 2.6 per cent of the Australian economy. After accounting for its inter-linkages with the rest of the economy—including services and supply companies—the sector is projected to be around 3.5 per cent of national output in 2030.

These figures are based on currently operating and under-construction LNG projects. Clearly, building more projects will only further increase the sector's contribution to the nation.



Competitive or complacent?

But high local costs and declining productivity mean that Australia could be priced out of further investment opportunities in the global LNG market.

Over the next decade, Australia will face increasing competition from other LNG producers. Maintaining competitiveness in the face of fiercely competitive rivals is the major threat to the Australian LNG industry's continued growth.

Australia is regarded as a high-cost location for LNG projects. For example, Australian costs for delivering LNG to Japan can be up to 30 per cent higher than projects in Canada and Mozambique.

This high cost is in part due to an inflexible and unbalanced workplace relations system that perpetuates industrial conflict and restrictive practices.

The current workplace relations system does not address the needs and priorities of Australia's employers and employees. Nor will it secure or optimise the economic benefits that current and future LNG projects can offer the Australian community.

Rather than providing a balanced framework for cooperative and productive workplace relations, the *Fair Work Act 2009* is delivering an imbalanced, adversarial and inflexible environment.

This has contributed to unreasonable labour costs and conditions. The industry is marred by anti-competitive agreements that do not reflect the real market situation. This benefits a small number of highly paid workers at the cost of the broader Australian workforce.

This problem affects ongoing operations and maintenance, but it is worst at the construction stage.

LNG projects involve massive and long-term capital investment decisions. This makes them vulnerable to short-term pressure from industrial agreement negotiations and disputation.

There is a real risk that companies, once subject to such pressure, will be deterred from making further investments in Australia.

The way forward

Low oil prices are now affecting project economics. While the oil and gas industry is experienced in managing this scenario and is focused on its business fundamentals and reducing costs, governments must also exercise discipline and drive critical policy and regulatory reforms.

Australia needs a policy and regulatory framework that attracts international investment. Reforming labour market policies will enhance the industry's ability to capitalise on growing demand for LNG.

In a recent submission to the Productivity Commission, APPEA outlined a 12-point plan for reforming the industrial relations system.

- 1 Establish a new category of agreement (Major Project Agreement) under the *Fair Work Act 2009* that applies for the construction lifespan of major projects or extend the term of enterprise agreements to six years for major projects.
- 2 Limit the scope of matters over which bargaining can take place and upon which agreement can be reached.
- 3 Outlaw forced pattern bargaining.
- 4 Provide scope in agreements for individual options and opt-outs.
- 5 Provide new options for making collective agreements.
- 6 Amend the object of the *Fair Work Act* to make clear that productivity and efficiency are high priorities that are taken into account when arbitrating bargaining disputes.
- 7 Offer greater capacity to terminate current agreements.
- 8 Make it harder to take protected industrial action.
- 9 Make it easier to end protected industrial action.
- 10 Impose greater penalties for unlawful industrial action, and enhance the capacity to seek injunctive relief.
- 11 Provide greater controls over right of entry to workplaces.
- 12 Improve anti-picketing and secondary boycott laws.

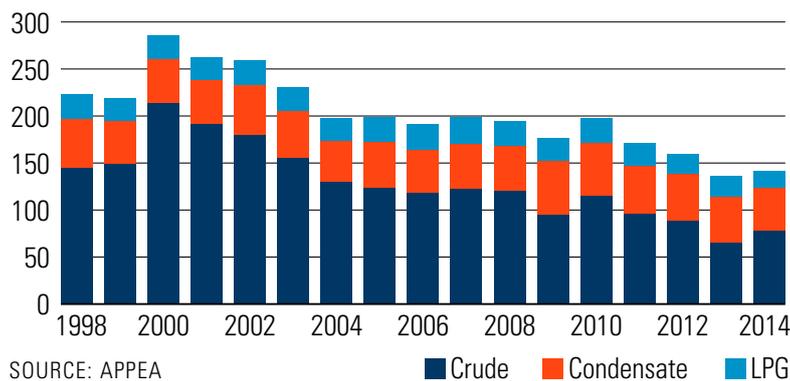
These reforms would not only enhance flexibility but also deliver certainty for industry and investors.

Good workplace agreements are fair on both sides and good for the country. The legislative framework must hold both sides to account and help deliver projects on-time and on-budget.

It is in nobody's interest for businesses to be made unprofitable or to have industrial strife deter future investment that would create more jobs and more tax revenue.

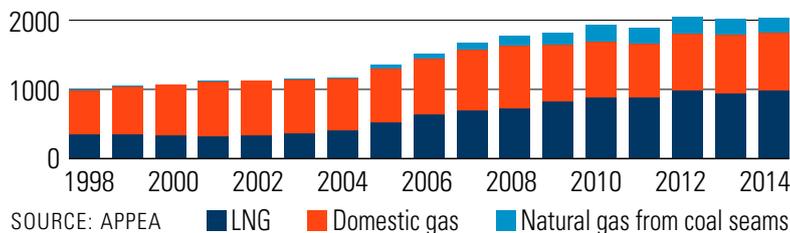
Oil and gas production and trade

Australian crude oil, condensate and LPG production (millions of barrels)



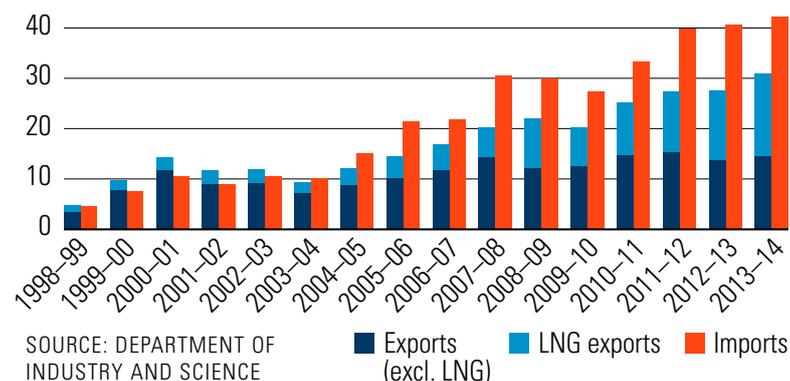
Since peaking in 2000, Australia's production of petroleum liquids has been steadily declining.

Australian natural gas production (millions of cubic feet)



Australia's natural gas production has more than doubled since 1998. This increase in production is meeting both domestic and international demand.

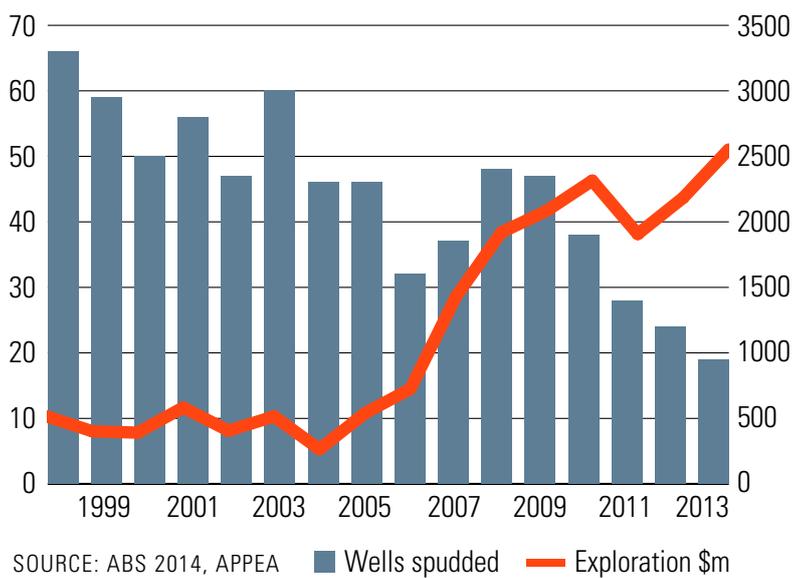
Australian trade in oil, gas and petroleum products (\$billion)



Until 2003-04, Australia had a trade surplus in petroleum, but since that time the country has been a net importer. Increasing LNG and condensate exports will help offset falling domestic oil production, reducing the petroleum trade deficit.

Exploration — rising costs but fewer wells

Annual offshore exploration expenditure & activity (\$billion)



The long-term growth in the Australian oil and gas industry depends on exploration. As existing oil and gas developments deplete, new resources must be found and developed.

But nowadays, oil and gas exploration and development fields costs much more than it once did.

A 2014 analysis of Australian Bureau of Statistics data showed the number of offshore wells drilled in this country had fallen by more than two-thirds since 2003, while the total cost had increased five-fold.

This analysis revealed the average cost of drilling an offshore well is now more than \$130 million.

Low-cost oil and gas fields are becoming increasingly depleted.

The industry must now develop higher-cost resources.

This means developing gas from coal seams or venturing into deeper waters or more remote parts of the outback.

The oil and gas industry must now develop higher-cost resources.

An essential forum in challenging times

This year's APPEA Conference and Exhibition will be held amid unprecedented change in the oil and gas sector, making it more important than ever as a forum for industry, policymakers and media.

The 2015 conference coincides with Australia's emergence as a globally significant petroleum producer.

Four world-scale liquefied natural gas projects have either recently been commissioned or are about to enter production.

Another three LNG projects — including the world's first floating LNG facility — are at earlier stages of construction.

By the end of 2017, all of these projects will have been completed and Australia will be the world's largest LNG exporter.

But the event also coincides with a period of low oil prices.

At the time of last year's conference, oil prices were above \$US100 a barrel and there were few signs of the dramatic change in market conditions that lay ahead.

One of the key topics at the conference will be how government, industry and the community can pave the way for continued energy investment to generate even more national benefits at a challenging time for the Australian economy.

Historically, oil prices rise and fall. They are low now, but they will rise again.

Australia is well placed to take advantage of future rises in the oil price.

The country clearly has the gas resources to underpin significant future development; it is developing major infrastructure that can be leveraged for future brownfields developments; and global demand for LNG remains strong.

But additional investment is unlikely to proceed until problems have been resolved in industry regulation, access to resources, tax and fiscal frameworks, workforce development and productivity.

APPEA 2015 will be a vital part of the discussion of these issues between industry and policymakers, and the development of much-needed solutions.

The conference's first plenary session will begin on Monday 18 May with an address by the Australian Minister for Industry and Science, Ian Macfarlane.

Victorian Treasurer Tim Pallas and Federal Shadow Minister for Resources Gary Gray will also speak at the event.

Politicians, their staff and senior bureaucrats will also attend conference presentations, attend social functions and meet with APPEA staff and industry executives.

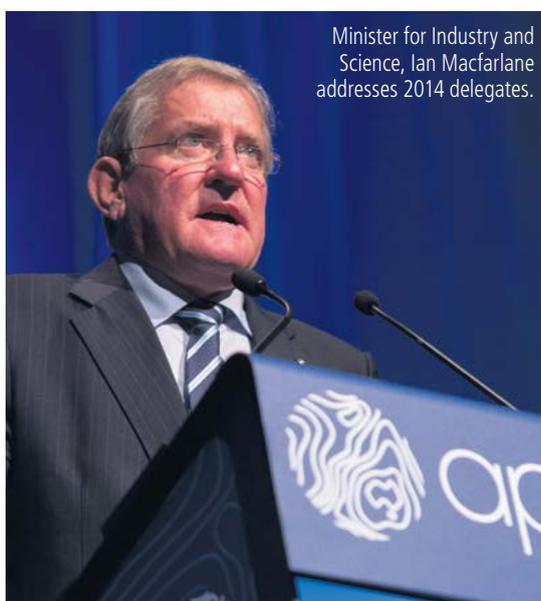




Plenary speakers will cover a range of topics crucial to energy security in Asia and Australia. These speakers include:

- Oxford Institute for Energy Studies Natural Gas Research Program Chairman, Professor Jonathan Stern, on the state of play in the global LNG market, including potential impacts on Asian gas markets
- BHP Billiton President, Petroleum and Potash, Tim Cutt, on the challenge of oil and gas development in a changing marketplace
- Chevron Australia Managing Director, Roy Krzywosinski on the importance of major capital projects in a national context
- WorleyParsons Chief Executive, Andrew Wood, on how the services sector is preparing for the shift into operations for mega-projects
- BP Vice President Exploration Asia Pacific, Dr Bryan Ritchie, on global trends in exploration, including the Great Australian Bight and reaching out to other new frontiers
- Astronaut and geologist, Dr Jim Reilly, on the need to keep expanding the industry's knowledge base and reaching for new horizons.

About 50 journalists will attend the event, reporting news and views to industry and the wider community. The exchange of ideas — both within industry and between industry and policymakers — is an important part of developing APPEA's policy positions.



Minister for Industry and Science, Ian Macfarlane addresses 2014 delegates.

News and insights on technical and operational issues are also important facets of this conference. APPEA 2015 features 24 concurrent sessions, each of which includes three to five presentations.

This year includes sessions on:

- the Petroleum Exploration Society of Australia's review of industry exploration and production over the past year
- the Australian Government's annual offshore acreage release
- exploration geoscience
- unconventional reservoirs and drilling
- technology and innovation
- health and safety
- effective management of environmental risks
- workforce management, including building diversity
- tax, commercial and financial management
- community engagement.



The North West Shelf LNG project: exporting gas since 1989 — with decades of production still ahead.

LNG projects to deliver benefits for up to 50 years

Australia's new LNG projects have the potential to operate for up to half a century and will deliver a rich array of benefits for the nation over that time, says Chevron Australia Managing Director, Roy Krzywosinski.

The \$200 billion LNG investment boom has grabbed the attention of the nation, but the long term national benefits of LNG operations post construction are not as well understood.

Mr Krzywosinski and other industry leaders have pointed out how expansion of the LNG industry will boost the oil and gas sector's annual contribution to the Australian economy to \$65 billion by 2020, or 3.5 per cent of gross domestic product.

But in an address to APPEA 2015, he will argue that the benefits extend far beyond these figures.

Mr Krzywosinski says developments such as the Chevron-operated Gorgon and Wheatstone projects will deliver intergenerational benefits in jobs, revenue and energy security that far outlast the relatively short construction periods.

The fast-growing LNG industry is a platform for the development of important new sectors of Australian expertise and industry that will have spin-off benefits throughout the community.

Among the most important of these new sectors is a strong local services industry that will support these multi-billion-dollar facilities' complex offshore and onshore needs for at least the next 40 years.

Perth is now also a centre of excellence in LNG and is fast becoming a global technology hub, in much the same way as Houston and Aberdeen, according to Mr Krzywosinski.

In 2007, Chevron set up a global technology centre in Perth and has subsequently invested more than \$1 billion in research and development projects in Australia.

Mr Krzywosinski's views echo those of APPEA Advisory Board Chairman Martin Ferguson, who recently told the Argus Australia and Global LNG Markets 2015 conference that the benefits of LNG projects were not widely understood.

"There is currently extensive public debate about east coast gas prices; the degree to which they are rising; and the degree to which the emergence of an LNG industry is in fact driving this shift," Mr Ferguson said.

He said that eastern Australian domestic gas prices would have risen with or without Queensland LNG, simply because exploration and development costs are rising.

"Queensland LNG developments have enhanced Australia's energy security," Mr Ferguson said.

"They have brought on new gas supplies and their massive infrastructure can be leveraged to greatly expand eastern states gas production.

"LNG development delivers massive spin-offs. It promotes regional development, fosters service companies and the development of skills bases and infrastructure.

"All of these factors are good in themselves, but they can also be leveraged for further development of both domestic and export gas."

Plenary Session

- Mr Krzywosinski will speak at the 8.30am Plenary Session — *The importance of major capital projects in a national context* — on Wednesday 20 May.

Innovation opening new opportunities

Innovation is a powerful engine of growth for the global petroleum industry, as illustrated so dramatically by the US-led shale revolution.

Australia has engineered some technical revolutions of its own that have underpinned industry-making opportunities. These include the world-first platform structures designed for the North West Shelf in the 1980s and unlocking Queensland's coal seam gas resources.

The latest chapter in Australia's long history of innovation is floating liquefied natural gas.

Shell's pioneering Prelude FLNG facility—now under construction—is destined for deployment in the Browse Basin, more than 200km from the nearest point on Western Australia's remote Kimberley coast. It would have been prohibitively expensive to develop this field through conventional technologies.

Innovation and the opportunities it creates will be the subject of a number of presentations at APPEA 2015, including *Floating LNG—a nice niche?* by RISC Advisory Principal Advisor, Martin Wilkes.

Mr Wilkes says the outlook for LNG appeared to be robust, despite the rapid growth in production capacity.

"New markets and suppliers are emerging and market dynamics are changing, in particular the marked increase in short-term contracts and spot market trading," he says.

Project operators have increased the capacity of processing trains to achieve economies of scale, but this demands an increasingly large base of gas reserves.

Mr Wilkes says this trend towards greater scale, together with a shift in market patterns, presents a market opportunity that can be filled by floating LNG.

"FLNG has a long way to go before becoming widely accepted as a standard development route, but we can examine how different approaches to FLNG are being taken to fill the space left by traditional land-based LNG solutions," he says.

Mr Wilkes will outline the potential opportunities and challenges that FLNG could present for Australia's onshore and offshore gas producers.

He will also outline the similarities and differences between FLNG projects and the development of the



An artist's impression of Shell's Prelude floating LNG facility.

floating production, storage and offloading (FPSO) fleet over the last few decades, and discuss the implications for FLNG development.

Big data, big opportunities

Another innovation topic at APPEA 2015 is *Big data analytics—lessons learnt from global E&P operators*, presented by SAS Institute Australia's Kevin Kalish.

While the upstream sector is no stranger to working with terabytes of data, Mr Kalish will explain how all producers and explorers can tap into new data sources to reduce risks and improve cost efficiency.

Data from 'intelligent wells' in real time could supplement historical datasets and analysis. By gaining more insight from these multiple datasets, engineers and stakeholders can make faster and more accurate decisions.

"By combining the traditional deterministic and interpretive workflows with a data-driven, probabilistic set of analyses, it is possible to predict events that result in poor reservoir or well performance or facility failures," Mr Kalish says.

Concurrent session 4

■ Mr Wilkes and Mr Kalish will speak at Concurrent Session 4—*Innovation—from big data to big tech*—at 2.00pm on Monday 18 May.

Big country, exciting frontiers

This year marks the 50th anniversary of Australia's first offshore petroleum discovery—Barracouta-1 in the Gippsland Basin.

By some measures, that makes Australia a mature petroleum country, but recent exploration activity shows we still have many highly prospective frontiers.

One of these is the Great Australian Bight, where BP has led an international rush of explorers since 2011.

BP, Statoil, Chevron and others are searching for multi-billion-barrel oil fields in an ancient river delta that rivals the modern-day Niger River system in West Africa.

At APPEA 2015, BP's Vice President Exploration Asia Pacific, Dr Bryan Ritchie, will discuss the company's bold frontier campaign in the Bight and how it fits with global exploration trends.

In 2011, BP was awarded four deepwater offshore blocks covering 24,000 square kilometres. In 2012, it completed a 12,000 square kilometre 3D seismic survey.

"We hope that our exploration activities in the relatively unexplored waters of the Great Australian Bight will lead to the opening up of a new oil and gas province," Dr Ritchie says.

"Technology will continue to be a key enabler in further unlocking resources."

After five years of careful study and preparation, BP aims to put the Bight to the test late next year with the scheduled drilling of its first exploration well.



Explorers are seeking huge oilfields beneath the waters of the Great Australian Bight.

Four wells will be drilled over an 18 to 30-month campaign, using a purpose-built deepwater drilling unit.

The Bight has long been considered Australia's best hope for its next major new oil province, although the recent Phoenix South-1 discovery in the frontier Roebuck Basin is challenging that idea.

The Apache Energy-operated Phoenix South-1 well was the first to successfully test the Lower Triassic levels of the vast area between the prolific Carnarvon and Browse Basins.

It discovered an entirely new oil play and has the industry rethinking its ideas about the Roebuck Basin's prospectivity.

Onshore frontiers

Untapped remote onshore regions are also showing exciting potential and have attracted several large players, including Santos and Origin Energy.

In the Northern Territory, recent seismic surveys have shown the

McArthur Basin covers a much larger area than previously believed.

The first deep well in the basin's history—the Santos-operated Tanumbirini-1—last year intersected elevated gas readings over a gross interval of more than 500 metres.

Even in the mature Cooper Basin, explorers are finding highly prospective new frontiers.

Unconventional gas in the Cooper's central troughs has been a focus of activity, but explorers believe there is considerable potential for conventional oil on the basin's eastern and northern flanks.

Plenary session

BP Vice President Exploration Asia Pacific, Dr Bryan Ritchie, will address the 8.30am plenary session on Tuesday 19 May, which covers science and innovation and the future of oil and gas exploration.



The Kipper Tuna Turrum project.

Project updates finale for APPEA 2015

The conference will come to a close with updates from the operators of four of the nation's most interesting petroleum projects—Ichthys LNG, Kipper Tuna Turrum, Central Australia and Gasification of the Pilbara.

The Project Updates session will deliver the latest information on approvals, construction and production, followed by a discussion with journalist and co-host of ABC's *Lateline*, Emma Alberici.

Ichthys LNG (INPEX)

The \$US34 billion Ichthys LNG project is Japan's largest investment in Australia and a key part of the global growth strategy for operator, INPEX.

Ichthys LNG comprises some of the world's largest and most advanced offshore facilities, as well as significant onshore infrastructure. The 889 km pipeline linking them will be the longest in the southern hemisphere.

While LNG will be the main product when the project starts up in late 2016, Ichthys will also produce up to 36 million barrels of condensate a year. This is equivalent to 25 per cent of Australia's total oil and liquids production in 2014.

More than 4,000 people were needed for peak construction on the LNG facilities near Darwin and thousands more are currently working in fabrication roles. A growing operations team is actively preparing for start-up.

INPEX's partners are Total SA, CPC Corporation, Tokyo Gas, Osaka Gas, Kansai Electric Power, Chubu Electric Power and Toho Gas.

Kipper Tuna Turrum (ExxonMobil)

The \$4.5 billion Kipper Tuna Turrum project is eastern Australia's largest domestic gas development. It includes construction of the Marlin B platform, the first Bass Strait platform in more than a decade.

Developing Kipper Tuna Turrum will help maintain output from Bass Strait, which has produced more than four billion barrels of oil and eight trillion cubic feet of gas over the past 40 years.

Production began in 2013 at Tuna (gas) and Turrum (oil). Gas from Turrum is currently being reinjected but will be sold from 2016 after completion of the Longford gas conditioning plant. Kipper production is also expected to start next year following the installation of mercury removal facilities at Longford.

Tuna and Turrum are part of the ExxonMobil-operated Gippsland Basin Joint Venture, in which ExxonMobil and BHP Billiton are equal partners. Kipper is also operated by ExxonMobil; Santos has a 35 per cent interest and ExxonMobil and BHP Billiton each hold 32.5 per cent.

Central Australia projects (Central Petroleum)

Australia's central oil and gas fields are undergoing a revival. Since 2013, Santos has invested \$100 million in appraising and developing its Mereenie fields, while also farming into nearby Amadeus Basin acreage held by Central Petroleum.

Meanwhile, explorer Central Petroleum recently became a gas producer with the commissioning of its Dingo gas project, which supplies Alice Springs.

Central is also moving aggressively to provide gas to the east coast gas market. It has announced heads of agreement with Incitec Pivot to supply up to 15 petajoules of gas a year from its conventional gas acreage in central Australia.

The deal relies on the construction of the North East Gas Interconnector to link the Northern Territory to the Moomba gas hub and the eastern states gas network.

Gasification of the Pilbara (Fortescue Metals Group)

Fortescue Metals Group's strategy of switching from diesel to gas across its Pilbara operations has achieved a major milestone with the recent completion of Fortescue River gas pipeline.

The 16-inch diameter pipeline runs 270km from the Dampier-Bunbury natural gas pipeline south of Karratha to FMG's Solomon Hub. It is the longest pipeline to be built in Western Australia in a decade.

This pipeline supplies gas to the 125MW TransAlta power station, which serves Fortescue's mining operations.

But the company has much bigger ambitions for gas in Pilbara. These could include switching mining trucks from diesel to gas, with the potential for major reductions in Fortescue's energy costs.

Plenary Session

■ The Project Updates Plenary Session will be held at 2.30 pm on Wednesday 20 May.



2014 National Health, Safety & Environment Conference and HSR Forum panel discussion

Upcoming APPEA events

APPEA NATIONAL HEALTH, SAFETY & ENVIRONMENT CONFERENCE AND HSR FORUM 7–9 September 2015 | Perth

This event combines health, safety and environment into one major conference for the Australian upstream oil and gas industry. The event will include presentations on the latest research, science, technology innovations and processes that are allowing the industry to continuously improve its health, safety and environmental performance.
www.appeahseconference.com.au

APPEA TAXATION AND COMMERCIAL CONFERENCE 28–30 October 2015 | Gold Coast

This biennial event brings together oil and gas industry taxation, legal, accounting and commercial professionals to discuss issues that affect the financial performance of companies in the sector. As delegate numbers are strictly capped, participation is limited to APPEA members and invited representatives from government.
www.appeataxconference.com.au

LNG 18 11–15 April 2016 | Perth

Australia, through the Australian Gas Industry Trust and APPEA, will host LNG 18—the 18th International Conference & Exhibition on Liquefied Natural Gas.

Held every three years, this international event is the world's largest and most prestigious LNG conference. It attracts up to 5000 participants from over 70 countries, including high-level delegates such as energy ministers and senior executives.

www.lng18.org

2016 APPEA CONFERENCE & EXHIBITION

5–8 June 2016 | Brisbane

The southern hemisphere's largest annual upstream oil and gas event returns to Brisbane. Get up to date and network through a world-class program of presentations, panel discussions, and social events at Australian oil and gas industry's premier event.

www.appeaconference.com.au

Introduction to the Oil & Gas Industry seminars

Developed and delivered in partnership with Curtin University, these half-day seminars will give delegates a broad understanding of the Australian oil and gas industry.

This introductory series is ideal for:

- employees new to the industry
- contractors
- government policy-makers
- professionals and advisors
- anyone seeking a basic understanding of the industry.

Attendees will gain an understanding of the industry's geological, technical and economic aspects, as well as the exploration, development and production phases.

These seminars will be facilitated by Curtin University's Professor Peter Moore with guest APPEA presenters. They will be held in all mainland capital cities.

For more information, see www.appea.com.au/events

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Paul Fennelly	Acting Chief Executive	Brisbane
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Moira Lawler	Manager Events Administration	Canberra
Jason Avery	Senior Officer—Events	Brisbane
Hannah Graham	Conference Administrator	Canberra
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Roma Sharp	Senior Policy Adviser—Productivity & Training	Perth
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Maryline Cassou	HSE Data Systems Project Manager	Perth
ECONOMICS		
Damian Dwyer	Director—Economics	Canberra
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Stedman Ellis	Chief Operating Officer—Western Region	Perth
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Adam Welch	Senior Policy Adviser—Western Region	Perth
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Rick Wilkinson	Chief Technical Officer	Brisbane
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Renee Bekavac	Executive Assistant & Office Administrator	Canberra
Anne Lowe	Finance Officer	Canberra
Tracey Pinto	Part-time Accountant	Canberra
Samarah Willetts	Office Administrator	Canberra

CONTACT APPEA

Head office

Level 10
60 Marcus Clarke Street
Canberra ACT 2600

t 02 6247 0960
e appea@appea.com.au

Brisbane

Level 36
32 Turbot Street
Brisbane Qld 4000

t 07 3231 0500
e brisbane@appea.com.au

Darwin

Suite 16, First Floor, Orchid Wing
48–50 Smith Street
Darwin NT 0800

t 08 8943 0675
e darwin@appea.com.au

Perth

Level 4
190 St George's Terrace
Perth WA 6000

t 08 9426 7200
e perth@appea.com.au

Sydney

Suite 4, Level 8
3 Spring Street
Sydney NSW 2000

t 02 8241 1900
e sydney@appea.com.au